For the first time in my life, I saw the horizon as a curved line. It was accentuated by a thin seam of dark blue light–our atmosphere. Obviously, this was not the "ocean" of air I had been told it was so many times in my life. I was terrified by its fragile appearance.

Ulf Merbold, West German space shuttle astronaut, 1990

Forum

Expert Testimony versus Junk Science

On March 30, the United States Supreme Court heard arguments in a case that may determine what standards should apply to the scientific evidence on which expert testimony is based. In *Daubert* v. *Merrell Dow Pharmaceuticals*, parents of children born with structural birth defects alleged that the defects were caused by Bendectin, an antinausea drug given to the mothers during pregnancy. Arguments on each side centered around the admissibility of expert testimony concerning the scientific evidence linking Bendectin to limb deformities.

A federal trial court in California refused to admit the scientific testimony provided by experts for the children's families, declaring that the opinions of the experts were based on animal studies suggesting that the chemical structure of the drug is similar to other known chemical teratogens and reanalyses of the data from studies on human cells. The court considered these techniques experimental and held that they did not meet the 1923 appellate court standard permitting only expert testimony based on scientific methods generally accepted by members of the scientific community (i.e., methods that had been published in peer-reviewed scientific journals).

The district court ruled for Merrell Dow, and the U.S. Court of Appeals for the Ninth Circuit affirmed, holding that the evidence from animal studies was insufficient and that the human cell study "reanalyses" had "neither been published nor subjected to the rigors of peer review. Although the qualifications of these experts were never disputed, their opinions were not allowed because they were inconsistent with the conclusions of studies that had been peer reviewed and published.

The United States Supreme Court must now rule on whether, as the attorneys for the children's families contend, the 1923 standard has been superseded by the Federal Rules of Evidence, established by Congress in 1975, which state that all relevant evidence should be admitted. The attorneys for the children's families are arguing for the more lenient standard of the federal rules which would allow the testimony and leave it to the jury to decide on its credibility. Attorneys for Merrell Dow counter that what some call "junk science" including experimental techniques and testimony from scientific "hired guns" tends only to mislead or confuse the fact-finding process and should not be admitted.

The case has great implications for environmental and toxic tort litigation and is being closely monitored by scientists, environmental and consumer advocacy groups, industry, and attorneys in environmental law. More than 20 groups have filed "friend of the court" briefs expressing support for both sides of the issue. The National Academy of Sciences and the American Association for the Advancement of Science have joined the Chemical Manufacturers Association and the National Association of Manufacturers in petitioning the Supreme Court to allow only peer-reviewed scientific evidence in personal damages cases. The American Trial Lawyers Association, the National Resources Defense Council, several highly respected epidemiologists, and state governments have filed briefs with the Court arguing that expert opinions must be admitted in these cases. The Court is expected to rule on the case by the close of summer session.

The Green Sink

In the United States alone, demand for resources and their use in manufacturing consumes nearly 178 billion kilograms of synthetic organic compounds annually, including over more than 318 million kilograms of pesticides. If you've ever wondered what happens to these compounds after use, you're not alone. Although some scientists have long believed that terrestrial and aquatic plants act as a sort of "green sink," taking in chemicals and rendering them harmless to humans and the environment, some are beginning to question whether the sink may eventually back up.

According to Michael Plewa, a scientist at the Institute for Environmental Studies at the University of Illinois at Urbana-Champaign, the energy flow of the biosphere begins with plants, which make up more than 90% of the total biomass of the earth. In addition to providing the earth's more than 5 billion people with oxygen and food, plants perform the vital function of absorbing xenobiotics, including certain pesticide residues, and metabolizing them into insoluble or "bound" fractions of plant cells, most of which is incorporated into lignin, a natural polymer of plant cell walls. Incorporation reduces the bioavailability (e.g., amount that may be taken up by an animal that eats the plant) of the products of this metabolism.

Down the drain. Are plant "sinks" backing up?